

Approved by:

_____/_____/_____
Process Engineer_____/_____/_____
Equipment Engineer

1 SCOPE

The purpose of this document is to detail the use of the Branson L3200 Asher. All users are expected to have read and understood this document. It is not a substitute for in-person training on the system and is not sufficient to qualify a user on the system. Failure to follow guidelines in this document may result in loss of privileges.

2 REFERENCE DOCUMENTS

- Material Safety Data Sheets for Oxygen and Nitrogen
- Branson L3200 Asher Operations and Maintenance Manual

3 DEFINITIONS

n/a

4 TOOLS AND MATERIALS

4.1 General Description

- 4.1.1 The Branson L3200 Asher is a fully automated single wafer processing tool used to remove cured and uncured photoresist coatings. It consists of 2 quartz vacuum chambers, an RF power supply, mass flow controlled gas delivery system, roughing pumps and pressure control systems (throttle valves), an electronics control system and an automated robotic wafer handler. The Asher employs two modes of process termination – end point detection and end of process time.
- 4.1.2 The Branson L3200 uses the stainless steel cassettes. Two cassettes are required – one for the sender and one for the receiver.

5 SAFETY PRECAUTIONS

5.1 Personal Safety Hazards

- 5.1.1 In the event of an emergency such as fire, gas alarm or any other serious problems, push the red emergency off switch. Immediately evacuate the area and notify a lab staff member or your lab instructor.
- 5.1.2 The ashing process uses Oxygen O₂. This gas is nontoxic but will accelerate combustion. Read material safety data sheets (MSDS) and be familiar with hazards and safety controls to prevent an accident, before using the system.
- 5.1.3 The Asher uses high voltage RF energy, which can result in burns or electrical shocks. **Never** operate the tool with the covers off.
- 5.1.4 The Asher uses pneumatic/mechanical drives to actuate the load-lock doors and wafer handling arms. These devices may move quickly and with great force. Do not insert objects (such as tweezers or fingers) into the asher for any reason including the recovery of a dropped or broken wafer.

5.2 Hazards to the Tool

- 5.2.1 Contaminants - **Wafers containing gold, copper or similar metals should not be introduced into the Branson Asher system to prevent cross-contamination of other wafers.** Aluminum or tantalum metals are acceptable. The back side of wafers should be clean to prevent contamination of the system.
- 5.2.2 Carefully load cassettes and never allow the handler to send a wafer to a slot that already has a wafer in it. Make sure that the wafer cassettes are facing in the correct direction and that no wafers are cross-slotted.
- 5.2.3 Do not attempt to ash partial, chipped or otherwise physically damaged substrates in this tool.
- 5.2.3 **DO NOT select "ABORT" if an error message appears during a process step. This can leave a wafer in the chamber, causing damage to the tool and wafer when a new program is executed.**

6 INSTRUCTIONS

6.1 Initial State Check and Service Chase Setup

- 6.1.0 Activate the **Branson Asher** card swipe interlock by logging in at **CARD SWIPE ACCESS 2** located in the cleanroom hallway.
- 6.1.1 Chambers 1 and 2 have separate roughing pumps and O2 deliveries. Both chambers are typically active. The tool is configured to run both chambers at the same time for all process programs.
- 6.1.2 Verify that the **MAIN SHUTOFF VALVE** on the **OXYGEN** bottle located in service chase 2735 is **OPEN** (fully counterclockwise - CCW) and the manifold is pressurized with at least **30 psi**.
- 6.1.3 Verify that the **GREEN** oxygen valve labeled **BRANSON ASHER - PHOTO 2** located on the **OXYGEN** manifold on the service chase wall is in the **ON** position and the pressure regulator is set to **15 psi**.
- 6.1.4 Verify that the **GREEN** nitrogen valve labeled **BRANSON ASHER - PHOTO 2** located on the **NITROGEN** manifold on the service chase wall is in the **ON** position and the pressure regulator is set to **25 psi**.
- 6.1.5 Verify that the **GREEN** nitrogen valve labeled **BRANSON ASHER - PHOTO 2 (VACUUM PUMPS)** located on the **NITROGEN** manifold on the service chase wall is in the **ON** position and the pressure regulator is set to **15 psi**.
- 6.1.6 Turn on the roughing pumps by pressing the **GREEN START** buttons on the **EDWARDS PUMP CONTROL BOXES** labeled **CHAMBER 1 RIGHT** and **CHAMBER 2 LEFT**. Currently we are using both chambers. If a pump fails to start, see a technician for assistance.
- 6.1.7 Normally, the system power is on. If the system is off and is not tagged out, the user can restart the **BRANSON POWER SUBSYSTEM** in **service chase 2735** located next to the vacuum pumps by verifying that the 5 subsystem circuit breakers protected by the Plexiglas cover are **ON**.

MAIN AC 30A
PRIMARY 120V XFMR 16A
120V AC CONTROL
WAFER HEATER
SECONDARY 120V AC

- 6.1.8 On the same control panel, turn **ON** the **SYSTEM POWER** and **RF GENERATOR** by pressing the **GREEN START** buttons. They should now be illuminated. The associated **RED** buttons will turn power **OFF**.
- 6.1.9 On the **ENI RF GENERATOR** (bottom panel) verify that the **AC LINE** switch is **ON**. The green indicator light will be lit.
- 6.1.10 Wait for the system start-up and robot initialization to complete.

6.2 Resetting the System

- 6.2.1 To wake-up a chamber that has been in hibernation, select **WAKE-UP CHAMBER** under the **OPERATOR MAINTENANCE** option in the **MAIN MENU**. Waking up the chamber turns off the hibernate mode, purges the chamber and vents it to atmospheric pressure while leaving the chamber closed.
- 6.2.2 When the chamber is awake, exit to the **MAIN MENU** and begin processing.

6.3 Operating the system

- 6.3.1 The reactor chambers may absorb a small amount of moisture when allowed to stand at room temperature with the chambers at atmosphere. If the Asher has been idle it is recommended to process 3 bare silicon wafers using the **WARM-UP** recipe. When beginning a run after the system has been inactive or off, or hibernate has not been on, 6 bare silicon wafers should be processed using the **WARM-UP** recipe to warm up each chamber.
- 6.3.2 Load the wafers on the left hand **SENDER** module with device sides up. Place an empty cassette on the right hand **RECEIVE** module. Be sure the cassettes are properly aligned and cover the sensor switches, and that all wafers are properly aligned and seated to the rear of the slots.
- 6.3.3 On the main menu, use the light pen to highlight the **SELECT RECIPE** button. Select the desired recipe from the menu,.

Sample Timed Recipes:

4" NORMAL ASH -> ashes 4" wafers with standard resist conditions. (70s)
4" HARD ASH -> ashes 4" wafers with hard baked and ion implanted resist. (140s)
6" NORMAL ASH -> ashes 6" wafers with standard resist conditions. (130s)
6" HARD ASH -> ashes 6" wafers with hard baked and ion implanted resist. (140s)
WARM-UP ASH -> will warm-up chambers. (100s)

Sample End Point Detection Recipes:

EPD 4" ASH -> ends ash cycle for 4 " wafers using end point detection.

EPD 6" ASH -> ends ash cycle for 6 " wafers using end point detection.

- 6.3.4 Verify that the recipe selected is displayed in the upper left corner of the main menu.
- 6.3.5 Select **RUN RECIPE** with the light pen. Select the starting and finishing positions of the wafers in the cassette. Position #1 is near the H-Bar end and position #25 is near the top of the cassette. Click OK.
- 6.3.6 **IF YOU ARE NOT SWIPED IN, THE ROBOT ARM WILL NOT PICK UP ANY WAFERS FROM THE SEND CASSETTE.** The process can be interrupted by selecting the **PAUSE RECIPE** button. The **EMERGENCY OFF** button should be reserved for emergencies only. You can easily resume processing after selecting **PAUSE RECIPE**.
- 6.3.7 Once the **PAUSE RECIPE** button has been selected, a message box appears describing the action needed – **UNLOAD, ABORT or CONTINUE**. You may resume processing by selecting the **CONTINUE RECIPE** button. The process will restart from the step and time in the program where it was paused.
- 6.3.8 **DO NOT SELECT THE ABORT BUTTON UNDER ANY CIRCUMSTANCES.**
- 6.3.9 To end the process after a **PAUSE**, select the **UNLOAD** button. If there are wafers in the chambers the system will clear them and ask where to put them. The default location is the cassette and slot it was removed from. *Make sure you do not place a wafer where there is already one present as this may cause damage to the wafers, cassette and/or robot.*
- 6.3.10 **If a RECIPE ERROR message appears, contact a technician for assistance. DO NOT SELECT THE ABORT BUTTON!**
- 6.3.11 When all of the wafers are finished, select **OK** and remove your cassette.
- 6.3.12 If you are finished processing, **DISABLE** the card swipe access by following the instructions located at **CARD ACCESS #2**.

6.3.13 During inactive periods, the system can be placed in **Hibernate** to maintain the chamber conditions. This permits rapid start up and consistent results. If you are putting the system in **Hibernate**, select the **OPERATOR MAINTENANCE** option in the **Main Menu**.

6.3.14 Select the **HIBERNATE CHAMBER #1** or **HIBERNATE CHAMBER #2** depending on which chamber you would like to put into hibernation.

6.4 Errors during Run

6.4.1 The L3200/6 system software contains numerous alarm messages. These are displayed when a parameter cannot be supplied to the process, or when a system malfunction occurs. Vacuum pump failure, an empty gas cylinder, or an obstruction in front of the robot arm are a few things that may cause an alarm message. Most alarms stem from misalignment of cassettes or loss of RF power, gas or vacuum.

6.4.1.1 **CASSETTE NOT PRESENT**: This indicates that the sender or receiver cassette is out of alignment or missing. Align the cassette properly on the platform and select **START**.

6.4.1.2 **CANNOT PUMP DOWN**: This indicates a problem with the vacuum pumping system. The pump may be turned off. See a technician for help.

6.4.2 Check the screen to determine what type of alarm has registered. If the cause of the alarm can easily be fixed (as in the case of repositioning the sender cassette on its platform), simply fix it then select **RESUME**.

6.4.3 If the cause of the alarm cannot be easily fixed, such as the loss of vacuum, process gases, or RF power failure, select **UNLOAD** to end the run. The system will unload the wafers from the chambers. Notify the tool technician so the problem can be corrected.

6.4.4 Sometimes the nature of the fault prevents the system from unloading the wafers. If the problem is not obvious notify the tool technician. **DO NOT** leave the tool unattended with wafers in the chamber(s). Tag it out if necessary.

6.4.5 The **EMERGENCY OFF** button (EMO) completely shuts down the system. To restart the system after the (EMO) button has been pressed, you must turn on **SYSTEM POWER**, the **RF GENERATOR** and the **VACUUM PUMPS** as outlined in the system start-up procedures. If there is a wafer stuck on the load arm or in the chamber, contact the equipment technician. Do not try to retrieve wafers by hand.

6.4.6 *Never reach your hand into the chamber to retrieve wafers.*
Serious injury may occur!

7 APPROPRIATE USES OF THE TOOL

Wafers containing gold, copper or similar metals should not be introduced into the Branson Asher system to prevent cross-contamination of other wafers. Aluminum or tantalum metals are acceptable. The back side of wafers should be clean to prevent contamination of the system.

8 ATTACHMENTS

8.1 Light Pen

- 8.1.1 When you point the pen to an active area on the screen, the area will become highlighted to verify which item is selected. All buttons, parameters and valves displayed with a white box drawn around the item are available for selection.
- 8.1.2 The light pen can be freely moved around the screen, since highlighting an item has no effect on the state of the system. To initiate a change, highlight the item and press and release the light pen button. If you move the light pen outside of the active area of the item before releasing the button, the action will not be executed and the item must be selected again. Keep this in mind should you select an item on the screen and decide the wrong function was chosen.
- 8.1.3 When a function or parameter is selected the color will change to show that it has been enabled. The function selected will begin when the button is released.

8.2 Performing a Leak Test

- 8.2.1 The leak test function allows you to test the leak rate, in mTorr/minute, for either or both chambers. The MFCs are set to full scale and the gas valves are closed. The chamber is pumped down for five minutes, the base pressure is saved and the vacuum valve is closed. The chamber is then allowed to leak up for five minutes. The leak rate is then determined from the current and base pressures and the chamber is vented to atmosphere. The leak and base pressure is displayed after the test is completed.
- 8.2.2 Process bare wafers with the WARM-UP recipe before performing a leak test.

R.I.T

Title: Branson L3200 Asher

Semiconductor & Microsystems**Fabrication Laboratory****Revision: F****Rev Date: 03/23/09****REVISION RECORD**

Summary of Changes	Originator	Rev/Date
Original Issue	Sean O'Brien	A - 02/03/03
Modified format and added cardswipe instructions	Scott P. Blondell	B - 04/03/03
Updated cardswipe interlock information	Scott P. Blondell	C - 09/15/03
Updated 6.1.1 to reflect 2 chamber operation	Scott P. Blondell	D - 12/11/03
Updated to include new hazards, instructions	Scott P. Blondell	E - 07/13/05
Updated to include new instructions (no ABORT)	Scott P. Blondell	F - 03/23/09